U.S. DEPARTMENT OF COMMERCE
National Technical Information Service

PB-254 496-T

SOLUBLE LUNG PROTEIN IN EXPERIMENTAL SILICOSIS AND BERYLLIOSIS

ENVIRONMENTAL PROTECTION AGENCY

1969

161045

PB 254 496 -T

BTR-76-104

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[Rastvorimyye belki legkogo pri eksperimental'nom silikoze i berillioze]

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Gig. truda i prof. zabol.,
Vol. 13, No. 9, 1969, pp.
46-47

REPRODUCED BY
NATIONAL TECHNICAL
INFORMATION SERVICE
U. S. DEPARTMENT OF COMMERCE
SPRINGFIELD, VA. 22161

Translated for EPA by

SCITRAN (SCIENTIFIC TRANSLATION SERVICE

SANTA BARBARA, CALIFORNIA

6

BIBLIOGRAPHIC DATA SHEET	1. Report No. TR76-104	2.	3. Recipient's Accession No.
4. Title and Subtitle Soluble Lung protein in experimental silicosis and Berylliosis			5. Report Date 1969 6.
7. Author(s) Veretinskaya, A. G.			8. Performing Organization Rept. No.
9. Performing Organization Name and Address Translated from the Russian by the EPA.			10. Project/Task/Work Unit No. 11. Contract/Grant No.
12. Sponsoring Organization Name and Address Translation Section Library Services Environmental Protection Agency Research Triangle Park, N. C. 27711			13. Type of Report & Period Covered 14.

15. Supplementary Notes Gigiena Truda i Professional'nye Zabolevaniya. Vol. 13, No. 9 1969, pp. 46-47.

16. Abstracts

17. Key Words and Document Analysis. 17a. Descriptors

EPAISD

17b. Identifiers/Open-Ended Terms

Soviet Union
Environmental Health- Health Effects.

17c. COSATI Field/Group

18. Availability Statement	19. Security Class (This Report)	21. No. of Pages
This translation was made from a non-copyrighted text.	UNCLASSIFIED	6
	20. Security Class (This Page) UNCLASSIFIED	22. Price 3.50

SOLUBLE LUNG PROTEIN IN EXPERIMENTAL SILICOSIS AND BERYLLIOSIS

[Rastvorimyye belki legkogo pri eksperimental'nom silikoze i berillioze]

A.G. Veretinskaya and N.G. Kurysheva*

Recently a very important role in the pathogenesis of silicosis and berylliosis has been attributed to the interaction of silicone and beryllium with proteins. Since the above compounds reach the organism mainly through the respiratory pathways, it is natural to expect the greatest changes in the proteins of the lung. Our objective has been to make a comparative study of the soluble lung proteins in experimental silicosis and berylliosis. The test animals were white male rats with an average weight of 130-150 g; 146 animals were used in the experiment. Experimental silicosis was produced by a single intratracheal administration of 50 mg quartz dust, with a size of the particles of 2-3 microns. The beryllium was administered by the same method, in an amount of 5 mg per rat.

The soluble proteins were isolated by the method of O.B. Kuzovleva. Their contents was determined by the method of Lowry, 1, 2, and 6 months from the beginning of the experiment.

The content of soluble proteins was calculated in gram percent and per whole lung. The obtained data were subjected to statistical analysis.

As shown by the results of investigations, the changes in the lungs of the experimental animals start taking place in the early stages of the experiment. A marked increase in the mass of the lungs is observed both in silicosis and in berylliosis. As early as one month after the sprinkling of dust, the weight of the lungs in both experimental groups of rats exceeds the normal

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weight twofold. With the passage of time in the experiment, the lung mass of the experimental animals continues to increase steadily; this increase is more marked in silicosis than in berylliosis. The greatest increase in the weight of the lungs in rats with experimental berylliosis was noted in the first month of the disease.

CONTENTS OF SOLUBLE PROTEIN IN THE LUNGS OF RATS DURING EXPERIMENTAL SILICOSIS AND BERYLLIOSIS

Time after administration of the dust (months)	Statistical parameter	Control		Silicosis		Control		Berylliosis	
		Protein contents in the lung (in mg)	Protein contents in the lung (in g%)	Protein content in the lungs (in mg)	Protein contents in the lung (in g%)	Protein content in the lungs (in mg)	Protein contents in the lung (in g%)	Protein content in the lungs (in mg)	Protein contents in the lung (in g%)
1	M	30,3	14,7	42,5	10,8	36,3	11,8	67,8	12,4
	$\pm m$	1,4	1,3	1,9	0,8	3,5	0,8	4,5	0,5
	t			4,8	2,5			5,5	0,7
2	M	36,6	15,4	39,0	6,8	44,1	13,2	87,2	14,0
	$\pm m$	3,4	0,2	2,3	0,5	2,4	0,4	4,5	0,4
	t			0,57	13,8			8,4	1,7
6	M	43,2	14,0	49,1	6,7	47,2	11,3	85,4	11,8
	$\pm m$	1,1	1,5	2,5	1,0	2,8	0,7	6,2	0,3
	t			3,1	5,9			5,6	0,4

The weight of the lungs, which in rats with experimental silicosis, exceeds twofold the normal weight in the first month of the experiment, increases even more considerably by the 6th month (2 1/2 fold as compared to the control).

Our task has also been to follow whether the increase in the weight of the lungs is connected with changes in the soluble proteins. As seen from the table, the amount of soluble protein in the lungs of control animals changes little with age; it averages 11-15%. One month after the administration of beryllium, the total content of the protein in the lungs of the sprinkled animals exceeds the normal content almost twofold.

The increase in the level of protein in the lungs of rats with experimental berylliosis reaches a peak by the second month (87.2 mg as against 44.1 mg), and it stays at the same high level throughout the period of investigation (6 months).

Different changes take place in the general level of lung proteins in rats with experimental silicosis. While in rats sprinkled with beryllium, the content of soluble proteins, exceeds almost twofold the normal value, 1 and 2 months after the beginning of the experiment, in rats with experimental silicosis, the increase in the amount of protein is only noted in the first month of the experiment. In subsequent periods of the investigations, the protein level is almost normal.

Thus, in spite of the sharp increase in the weight of the lungs in rats from both experimental groups, the degree of expression of the changes in the content of soluble proteins is different.

The differences noted in berylliosis and silicosis are even greater when the protein is calculated per unit weight of tissue, i.e., when it is expressed as concentration. The type of changes in protein concentration is opposite compared to the changes of its total contents in the experimental groups. While the total protein contents in rats with experimental berylliosis exceeds markedly the normal value, their concentration increases only slightly.

In silicosis, the concentration of soluble proteins is lower by a factor of 1 1/2 than in the control, as early as one month after sprinkling. Two and six months after beginning the experiment, the difference becomes even more important (6.8 g% as against 15.4% in the 2nd month, 6.7 g% as against 14 g% in the 6th month).

Consequently, unlike experimental berylliosis induced in animals sprinkled with quartz dust, here the protein concentration decreases sharply compared to the normal value.

Data on the contents of soluble lung protein in experimental silicosis and berylliosis show that the changes occur in opposite directions. While under conditions of experimental silicosis, a sharp decrease takes place in protein concentration when its total content in the tissue is almost unchanged,

in berylliosis, on the contrary, an increase in total protein content is observed and a lack of change in protein concentration.

With regard to the dry weight of lungs, it characteristically increases both in silicosis and in berylliosis. The increase in the weight of the lungs in rats with experimental berylliosis coincides in time with the marked increase in the total amount of soluble proteins. No such relationship was found in silicosis.

In this connection, one must assume that the increase in the weight of lungs in berylliosis is due to a certain extent to the increase in the contents of soluble proteins. Evidently, in silicosis, the increase in the weight of the lungs is due to different factors.

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PB 254 558 -T

BTR 76-92

BIOLOGICAL EFFLUENT PURIFICATION AT CHERVONOZNAMEN SUGAR PLANT

[Biologicheskaya ochistka stocknykh vod na Chervonoznamenskom sakharnom zavode]

by

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Published in *Sakharnaya Promyshlennost'* Vol. 46, No. 11, 1972, pp. 29-32

The first, in the USSR sugar industry, purification installations for effluent purification, with artificial biological purification, in place of the presently used natural purification in filtration fields or in biological reservoirs, were built at the Chervonoznamen Sugar Plant (Odessa Region) [1]. Biological purification by the new scheme is accomplished in very tall biological filters, packed with foam glass lumps (Fig. 1). Extensive studies, conducted here in the country and abroad, on removal of organic matter from the highly concentrated industrial effluents, have demonstrated the effectiveness of use of lump packing.

Translated for NERC-Library, EPA, by LEO KANNER ASSOCIATES, P. O. Box 5187, Redwood City, CA 94063, (415) 365-3046, August 1975.

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